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DETERMINISTICALLY DOPED FIELD-EFFECT DEVICES AND METHODS OF MAKING SAME

Abstract

Deterministically doped field-effect devices and methods of making same. One or more dopant atoms, also referred to as impurities or impurity atoms, are arranged in the channel region of a device in engineered arrays. Component atoms of an engineered array are substantially fixed by controlled placement in order to provide a barrier topology designed to control of source-drain carrier flow to realize an ultra-small device with appropriate, consistent performance characteristics. Devices can be made by placing atoms using proximity probe manipulation, ion implantation, by facilitating self-assembly of the atoms as necessary, or other techniques. These atomic placement techniques are combined in example embodiments with traditional methods of forming a substrate, insulators, gates, and any other structural elements needed in order to produce practical field-effect devices.